

Aalto University
School of Science
Degree Programme in Computer Science and Engineering

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Educational games and motivation in on-line courses

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ABSTRACT OF
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<p>Online courses provide an interesting and convenient way for schools to provide teaching. It enables students to participate in courses that they might otherwise find impossible to participate. However, multiple studies have found out that online courses suffer from large dropout numbers and low commitment, both of which lessen its usefulness. Educational games are another novel method of teaching which uses games as a way to teach. However, even though research on the effects of educational games has been mostly positive, they haven't yet received any widespread adoption. In this thesis, I will look into the motivational factors found in both online courses and educational games to try to better understand how to keep students motivated in an online course. I will also try to determine whether educational games could be used as a method to improve motivation in online courses. In order to find motivational factors, I studied a hybrid course that used an educational game as a part of the course. 55 learning diaries from the course were analyzed sentence by sentence using sentiment analysis. These sentences were then placed into categories and the motivational factors rose naturally from these categories. The number of sentences in the category told the importance of the category, and positivity and negativity given by sentiment analysis told the effect on motivation. The motivational factors that were found were mostly in line with existing literature with factors like feedback, communication and simulation realism proving important. It was also obvious from the results that the students were both excited and interested in getting a chance to play an educational game. This tells us that educational games are something that can be used to improve low interest and commitment in online courses. In the final chapter, we analyze the results in more detail and consider what kind of future work could be regarding motivation and both educational games and online courses.</p>			
Keywords:	educational games, online education, distance education, motivation		
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<p>Verkkokurssit tarjoavat mielenkiintoisen ja kätevän tavan kouluille tarjota opetusta. Ne mahdollistavat osallistumisen kursseille, joille osallistuminen saattaisi muuten olla opiskelijalle mahdotonta. Kuitenkin lukuisat tutkimukset ovat huomanneet että verkkokurssit kärsivät suurista keskeyttämisnumeroista ja alhaisesta sitoutumisesta. Opetuspelit ovat toinen novelli opettamisen keino. Vaikka tutkimukset opetuspelien tehokkuuteen ovat olleen pääsääntöisesti positiivisia, ei niitä ole ainakaan vielä otettu laajaan käyttöön. Tässä työssä tutkin sekä verkkokursseista että opetuspeleistä löytyviä motivaatiotekijöitä, jotta voitaisiin paremmin ymmärtää, miten pitää opiskelijat kiinnostuneina verkkokursseilla. Yritän myös selvittää voisiko opetuspelejä käyttää verkkokurssien parantamiseen. Löytääkseni motivaatiotekijöitä tutkin hybridikurssia, jolla käytettiin verkossa pelattavaa opetuspeliä osana kurssin suoritusta. 55 opetuspeleistä kirjoitettua luentopäiväkirjaa hajotettiin lauseiksi ja analysoitiin tunneanalyysillä. Tämän jälkeen nämä lauseet kategorioitiin ja näin syntyneet kategoriat muodostivat tutkitut motivaatiotekijät. Lauseiden määrä kategoriassa kertoo kyseisen tekijän tärkeydestä ja positiivisten ja negatiivisten lauseiden määrä tekijän vaikutuksesta. Löytyneet motivaatiotekijät olivat pääasiassa linjassa olemassa olevan kirjallisuuden kanssa. Tekijät kuten palaute, kommunikaatio ja opetuspelin immersio osoittautuivat tärkeiksi tekijöiksi. Tuloksista oli myös selvää että opiskelijat olivat innoissaan tilaisuudesta päästä kokeilemaan opetuspeliä. Näin ollen on selvää, että opetuspelit voivat olla työkalu parantamaan alhaista motivaatiota ja sidonnaisuutta verkkokursseilla. Viimeisessä kappaleessa käydään tuloksia tarkemmin läpi ja pohditaan minkälaisista tutkimuksista tämän aiheen parissa voisi tulevaisuudessa tehdä.</p>			
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Chapter 1

Introduction

Motivation can be defined as willingness or desire to engage in as task. In education, motivation is efficient tool for reinforcing the learning experience. John M. Keller from Florida university developed a model for motivational design in educational environment.(Keller 1983) This model, the ARCS Model of Motivational Design, identifies four components for motivating instruction:

- Attention strategies for arousing and sustaining curiosity and interest
- Relevance strategies that link to learners needs, interests and motives
- Confidence strategies that help students develop a positive expectation for successful achievement
- Satisfaction strategies that provide extrinsic and intrinsic reinforcement for effort

The effects of motivation on learning are well researched. Motivation has been linked with success in education in general. (Tallent-Runnels and Liu 2006) On top of that, motivation has been linked with strengthening attention and selection of information.(Denis and Jouvelot 2005) It is pretty obvious that motivational design is important part of and successful educational design.

Online courses open a whole new world of education for people who might have hard time participating in normal education. People who have no time or money to join traditional courses or might be physically located far away from, can still participate to online courses. The amount of online courses will most likely increase in the future and many universities and schools

are already offering online courses. However, online courses are not without their problems. One of the biggest problems that online courses face is lack of motivation from the students and high dropout numbers (Lee and Choi 2011). When students are not tied so strongly into the course, it is easier to give up due to various problems than on a traditional course. This can also lead to the perceived problem that students do not want to participate in online courses, even though the real problem is that current online courses are not designed well. In order to improve online courses in general, faculties need to find methods to keep students engaged and motivated.

Educational games are games that are designed for educational purposes. While educational games have received a lot of research such as (Filsecker and Hickey 2014), (Bizzocchi and Paras 2005), (Denis and Jouvelot 2005), (Moreno-Ger et al. 2008), and have been tested in various environments, they haven't yet properly been accepted as a means of education. However, it is a characteristic of a good game to keep the player entertained and engaged. This combination of players having fun and being deeply engaged leads to high motivation to complete the game. Gaming is also very widespread these days and most students would be familiar with them at least somewhat. (Papastergiou 2009) Thus, educational games could be used to solve the motivation problem on online courses. However, in order to be effective, the game needs to be designed correctly.

Educational games also naturally apply to many of the earlier mentioned Keller's ARCS model components. As a relatively new medium, educational games would rouse curiosity and interest. They also naturally provide both extrinsic and intrinsic reinforcements to the player. With good design the game can also be relevant to students learning goals and boost their confidence through successful play sessions.

1.1 Research questions

In this thesis, I will perform a case study on an educational game used on a course in Aalto University. This course is a hybrid course that uses a business game to teach students about networked service business environment. I will analyze the thoughts the students had about the game in their learning diaries and try to answer the following questions:

1. What motivational factors exist in online courses with educational games?

2. How important are these factors for motivation?
3. Can educational games improve online courses?

In order to understand how to keep students motivated in online courses and how to build motivating educational games we need to understand what are motivational factors for both of these. Motivational factors in this case meaning factors that affect motivation either positively or negatively. After sufficient motivational factors have been found, it is needed to ascertain how important these factors are. This will help us in designing better courses and games by telling us what to prioritize in. Finally, I will try to conclude whether educational games could be used to combat motivational issues in online courses.

This thesis will first go over previous research done both on motivation on online courses. Factors that influence student motivation and importance of motivation on online courses will be discussed. I will also go over research on educational games and see what kind of motivational factors previous researchers may have found. I will also explain the business game used as case study in greater detail. Then, I will go over in more detail my research methods and material. Sentiment analysis that was used as an analysis tool will be explained in detail. The results chapter will contain the results obtained in this study. I ended up with six categories for motivational factors that are mostly in line with previous studies. Finally, I will draw my conclusions and give recommendations on using educational games for online courses.

Chapter 2

Literature Review

2.1 Gamification

Gamification is a term that is often seen together with educational games. One paper defines it as the use of game-play mechanics for a non-game application. They have also listed other possible definitions for it, such as integrating game dynamics into a site or service, and the use of game play mechanics to solve problems and engage audience. (Xu 2011) Gamification is sometimes mixed with Educational games (called Serious Games by Xu due to multiple definitions for both. (Xu 2011) However, they are different things. Gamification means adding partial game mechanics into another product or service, whereas educational games are complete products themselves. Gamification is not a new idea, with some applications of gamification tested already in 1980s (Deterding 2012).

Hamari et al. reviewed the literature research done on gamification so far in year 2014. In their review, they catalogued the different ways that gamification has been implemented in different studies. Though there were many methods to implement gamification, by far the most popular were points, leaderboards and badges. (Hamari et al. 2014) There has been some critique against gamification, such as Deterding, about missing the point of gaming. By reducing well designed games to their single components, you might actually hurt student motivation. Gamification should include game design and not simply game components, if it wants to be successful (Deterding 2012). Gamification can be seen as a tempting alternative to educational games as it is often easier and cheaper to add gamification elements to existing software than develop entirely new educational software.

There has been quite a lot of research done of gamifications effect on motivation. For instance Hamari et al. reviewed 24 studies done on gamification with the high level research question being: does gamification work? (Hamari et al. 2014). Naturally in many of these papers one of the things studied was the effect of gamification on student motivation. The results of the studies on motivation have been somewhat mixed. On the other hand, people are hard-wired to enjoy gaming. Studies have shown that playing games stimulate the pleasure centers of the brain (Xu 2011). Most of the studies reviewed by Hamari et al. reported positive effects and benefits produced by gamification. Majority of the papers reported positive results for some motivational affordances, however, only two papers reported positive results for all tests. Some of the reviewed studies also showed that the results of gamification might not be long lasting and might fade after the novelty factor wears off. (Hamari et al. 2014)

2.2 Online courses

In this thesis, the course types are divided to traditional courses, mixed courses and online courses. Traditional courses refer to courses held face-to-face in a class or a lecture room with both the lecturer/teacher and students present. Online courses use internet and communication technologies to teach students who don't need to be in a same physical location (Clayton et al. 2010a). Mixed course (also known as hybrid course) is mixture between these two, having some traditional course elements and some online course elements. TU-E2000 is a good example of a mixed course as it has both traditional lectures but also the business game part, which is played entirely online without any face-to-face meetings with course staff (except for the opening lecture). Depending on the way the mixed course is constructed, it may be possible to detach the online component and study it as a single entity. In this thesis, I study the TU-E2000 Network Service Business game as an online course, even though technically it is part of a mixed course.

To understand the importance of motivation in online courses, we should first compare online courses to traditional courses. In a study done by Clayton et al., majority of the participants preferred traditional courses compared to online or hybrid courses. Reasons to prefer online courses were for instance desire to engage in discussion with the professor and other students, feeling that a traditional course setting fits their learning style better and familiarity with the traditional course setting. Reasons for picking online or mixed course were most often augmented learning, meaning that the learn-

ing process can be enhanced by the inclusion of technology, and lifestyle fit, meaning that online/mixed were convenient to the participants schedule. (Clayton et al. 2010a) In a literature review performed by Tallent-Runnels and Liu, multiple researches have noticed that communication between students is often shallower in an online course (Tallent-Runnels and Liu 2006).

There has been some studies regarding the role of motivation in online courses. Motivation has been linked with success in education in general in multiple studies (Tallent-Runnels and Liu 2006). However, its effect on student success in online environment has been less studied. There are some studies however, with slightly mixed results. In one study (Waschull 2005), motivation was indicated as one of the most important reason for success in an online learning environment. On the other hand, another study (Simmering et al. 2009) done in 2009, didn't find a strong correlation between motivation and success in online courses. One of the biggest challenges faced by online courses is the dropout rate (Lee and Choi 2011). Multiple studies have been made to study the reasons and rates of dropouts on online courses, like (Willing 2009) (Liu 2007) (Chyung 2001). The definition of a dropout is often different in the studies but their results are mostly similar. Lee and Choi reviewed 35 studies made about about online dropout rates in years between 2000 and 2010. Their review found out that majority of the studies indicated significantly higher dropout rate in online courses compared to traditional courses. (Lee and Choi 2011) The studies in the review had also listed reasons why the students had decided to drop out. One of the most popular reasons listed in different studies was motivational reasons. Many of the studies did indeed show significant correlation between student motivation and course completion and retention. (Lee and Choi 2011) Another study done in 2009 also mentions that motivating learners would lead to decreased dropout rates and online courses should be created in a such a way as to motivate students. (Ji-Hye Park 2009)

While the importance of motivation for success in an online course has mixed results in studies, it is clear that motivation is very important when it comes to completion and retention in online courses. There are only a few papers on studying the factors that affect student motivation in online courses. Clayton et al. found out that the confidence in the fact that a student can complete the course successfully affects their motivation as well as relationship with faculty and the other students. (Clayton et al. 2010b) Another study found course feedback to be an important factor in motivation (Garris and Driskell 2002). One of the objectives of this paper is to find other possible motivation factors in online courses.

If students prefer traditional courses and there are multiple problems associated with online courses such as shallower participation rate and higher dropout rate, then why not simply stick to traditional courses? Online courses offer many advantages compared to traditional courses. They provide a way to offer education to large masses of people. Not everyone can afford the time or money needed for a traditional university experience. Instead we must work with the students on their own terms. (Carr-Chellman and Duchastel 2000) It is also the opinion of the author of this thesis that many of the problems associated with online courses are related to the fact that they are a relatively new phenomena. Because of this, most students are not used to them and might prefer traditional courses due to familiarity. Because online courses are a new thing, they are also not yet well understood and thus can often be designed badly. That is why it is important to understand how to design a good online course. One of the important factors in designing a good online course is how to keep students motivated. Motivated students are more likely to complete a course instead of dropping out (Vallerand 1997), which has been a huge challenge for online courses (Lee and Choi 2011).

2.3 Educational games

Wikipedia defines educational games as follows: "Educational games are games explicitly designed with educational purposes, or which have incidental or secondary educational value. ... Educational games are games that are designed to help people to learn about certain subjects, expand concepts, reinforce development, understand an historical event or culture, or assist them in learning a skill as they play" (Wikipedia 2016). Moreno-Ger et al. also mention that basically any initiative mixing video games and education can be considered game-based learning. (Moreno-Ger et al. 2008)

Lot of research has been done on educational games and why they should be considered over traditional education in certain cases. Most importantly, as Papastergiou mention in their paper, games are very widespread in modern world (Papastergiou 2009). This means that most students are already familiar with games and gaming. Games can also potentially be very efficient learning environments and often can also enhance other things than just knowledge (Papastergiou 2009). One study even linked educational games with high effect on academic achievement (Kebritchi et al. 2010). Educational games also seem to have a strong effect on student motivation. This would make educational games a valid tool for online courses where student motivation can be a considerable problem. Also, as Habgood and Ainsworth

mention in their paper, educational games do not need to completely replace the traditional education but should simply be considered as another tool for the teacher to use (Habgood and Ainsworth 2011).

So how do educational games affect motivation on courses they are used on? Many studies are erring on the side of caution and saying that their results are somewhat inconclusive but also admit that there seems to be a positive effect on motivation. One study found direct good effect on motivation when using an educational game for a computer science course. (Papastergiou 2009) Another study links to multiple papers claiming positive results but also mentions that these studies show inconsistent patterns of results with motivation and learning (Filsecker and Hickey 2014). The same study is also afraid that extrinsic motivation (such as different kinds of rewards in games) might have a negative effect on intrinsic motivation. However, the paper concludes that the negative effects of extrinsic motivation are less likely to appear in educational games. A paper by Denis and Jouvelet also mentions that fun is a great source of intrinsic motivation (Denis and Jouvelet 2005). Fun is also something often linked with gaming and video games in general.

Some research has also been done on how motivating educational games should be implemented on a course. Many of these guidelines have been used when designing the Network Service Business Game.

Bizzocchi and Paras mention in their paper that an earlier study by Lepper and Malone illustrated four key points for designing educational games. The first point is that the learner should feel continually challenged. The difficulty of the game should increase in accordance with the learner's skill. Secondly, the game should inspire curiosity in the learner. Third, the learner should feel in control during gameplay through endogenous feedback. Finally, the game should use fantasy as a means to reinforce instructional goals. (Bizzocchi and Paras 2005)

Denis and Jouvelet also list best practices for creating an educational game. They argue that first of all games should reify the values the game should express directly into the rules of the game. The values would then be imparted to the player naturally through interactions in the game. Secondly, the player should be given power to explore the game and test the rules, experiencing meaningful feedback from his actions. Barriers, such as game's technical difficulty should be adjusted to match the students. Fourth, the game should not follow a preset trajectory but should instead contain alternatives and space to explore. Finally, the game should utilize all available channels for fostering communication between students, and between students and the faculty. (Denis and Jouvelet 2005)

Another study done by Moreno-Ger et al. came up with pedagogical requirements for educational games in an online environment. The first one is integration with online education. They argue that educational value of these games could be greatly increased by integrating them with the latest e-learning standards and platforms. Additionally, when designing the education game, the designers need to remember that the target audience is often quite heterogenous. Another listed pedagogical requirement is adaption. Adaption has a very important role in quality of educational experience. Final listed pedagogical requirement is the the assessment. Assessment is always a very important part of educational experience. Thankfully because games are usually a rich interactive experience and this interactivity can be used for assessment purposes. (Moreno-Ger et al. 2008) Student activity and actions can easily be stored and analyzed in a game environment.

Many other studies have smaller things to add on designing educational games. The fantasy in the game should be endogenous fantasy, that is, the actions in the game should match the learning goal. For example running a business to learn about taxation. This has a stronger effect than on motivation than external fantasies. (Garris and Driskell 2002) Educational games should also be intrinsic, i.e., they should try to motivate students intrinsically instead of using extrinsic methods.(Habgood and Ainsworth 2011) Like mentioned earlier, Filsecker and Hickey found that the negative effects of extrinsic methods are not visible in educational games (Filsecker and Hickey 2014), intrinsic methods are still more effective and should be used.

Bizzocchi and Paras mention that play happens in a "magic circle", where the learner is able to suspend all belief. They argue that an educational game is much more effective if it can keep the learner inside this magic circle. As such, immersion has a very important role in keeping the learner inside the magic circle. Old educational games are not often very immersive, they often do not let the player freely explore and the game-play elements can be separated with content elements. (Bizzocchi and Paras 2005)

Chapter 3

Network Service Business Game

Network Service Business Game

The Network Service Business Game is a business game created for the course "TU-E2000 Aalto Introduction to Services" in Aalto University. The game is played during the course as an separate online component. Its main goal is to provide a practical example of the modern world of service businesses to students. Students need to form networks of businesses and work together to succeed.



Aalto University

The Aalto Service Network Business Game is an interactive business game focusing on co-operation between companies in a service ecosystem. The topic of the game is Space Tourism. The game is a part of the course Aalto Introduction to Services (Course Code: TU-E2000).



"Being the richest man in the cemetery doesn't matter to me.. Going to bed at night saying we've done something wonderful.. that's what matter to me."

— Steve Jobs

[About](#)

Figure 3.1: The main screen of the Network Business Game

Most modern business games are build so that the students compete against each other in a simulated environment, trying to become the best company. Often students control a company alone. This is not very reflective of real business environments. In a real business environment, companies form networks of services where every company affects the end product. In the Network Service Business model, the students are divided into groups and each

group gets a company that they must co-operatively control. They must then form contracts with other companies in order to be able to sell the end product to the customer. Not only is this a more realistic view of how businesses operate in real life, it also promotes communication and teamwork between students. As mentioned earlier, this is important for motivation in an online course.

The course itself consists of lectures, a exam based on the lectures and the game. The game is played entirely online and is separate from the lectures, except for a single introduction lecture. This makes Aalto Introduction to Services a hybrid course. Communication about the game is handled through a facebook group dedicated to the game. All students in the group also have each others emails so that they can connect each other.

Theme of the game is set by admins and course staff but it will always be about selling services. Theme used in the course so far has been space tourism where students try to sell space flights to students. Different types of company types have to work together as a network to make the launch a success. The admins of the game can choose what kind of company types are present in the game but on the course four company types: Sales and Marketing, Ground operations, Space vehicle and Customer operations, have been used. These company types together form a complete network.

The game consists of three rounds with a different objective in each round. There is deadline after every round after which the objectives of that round must be completed. The students are free to work in their own pace as long as objectives are completed on time. Each company is directed by a group of 2-5 students. The groups are divided by the course staff after all students have registered for the game. This allows the course staff to create multidisciplinary teams. The students are then given a company of certain type to play with. The main objective in the game is to be part of the most successful network in the game with a side objective of being the most successful company of that company type. This forces the groups to consider the well-being of their whole network while also looking after their own company. The group can decide on multiple values, such as investment on service quality and starting market, that will affect how well their company and the network they belong to perform in the game. Some of these values must be decided once and are then locked, while others can be changed freely at any time. This encourages communication both inside the group and inside the network to optimize the values.

3.1 Game rounds

The objective of the first round is to create a business model canvas for the company. The students need to fill a business model canvas based on an existing template. Currently the game uses a business model canvas based on the work of Osterwalder et al. (Osterwalder and Pigneur 2013). Everyone in the group needs to fill part of the business model canvas based on their selected role. After the business model canvas is finished, it is reviewed by the course staff.

Company business plan is not ready yet.

Status of all the parts in the business plan:

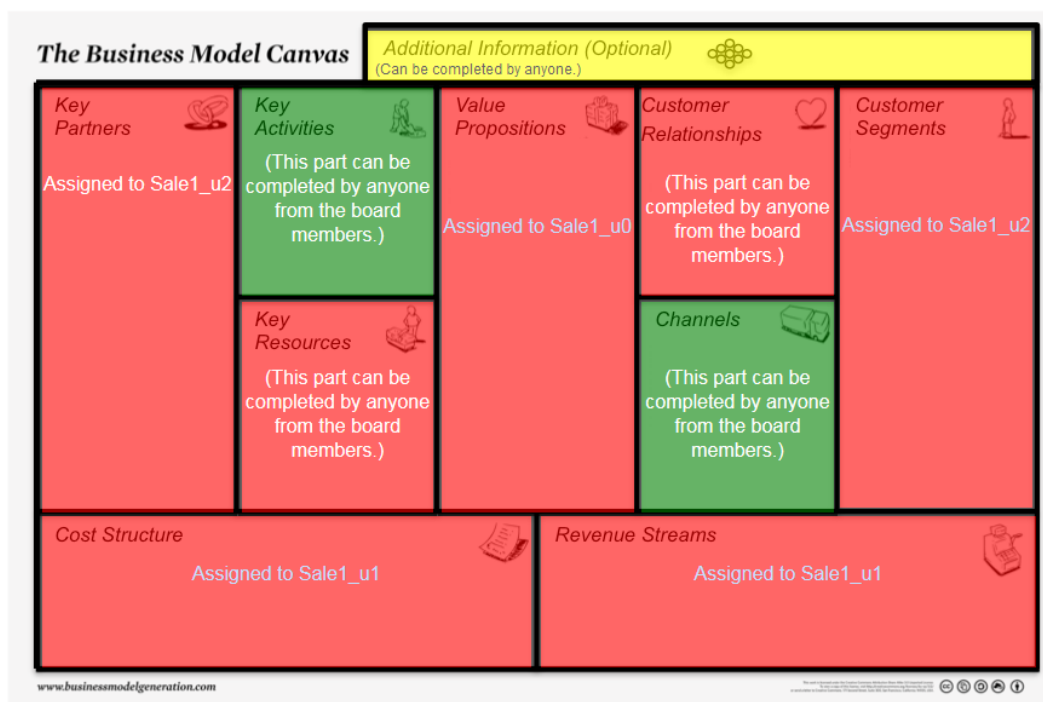


Figure 3.2: The business model canvas edit page

The purpose of the business model canvas is three-fold. First of all, it has been gone over in the lecture, so the first round provides an useful practical example. This allows course staff to evaluate how well the business model canvas was understood during to course. Secondly, it helps players strategize

in the game. The finished business models are public, so the groups can look through other companies business models and think who they want to partner with. Companies that have already decide on potential partners have a lead when round two starts, as they can immediately start sending bids and RFP:s to other companies. Finally, the business model canvas also works as way to check early on that all users in the group are still committed to the game. Since all users in the group must fill up part of the business model, the group can quickly spot if a member is missing in action. Students receive a bonus on their starting capital based on the grade their canvas received. This provides motivation both inside the game (i.e., extra capital) and outside the game (i.e., effect on course grade) to complete the business model canvas with care. After the canvas is reviewed, the first round is complete. The group is free to decide their company values such as starting market if they wish but no further action is required in order to continue to round two.

The second round is the part where the Network Service Business Game differs from most other business games. The objective of the second round is to form a functional network with other companies. To be able to provide the service to the end customer in the NSBG, companies need certain variables. Other companies are able to produce these variables, but cannot sell them to end customer. This means that when these companies work together, they are able to provide the service to the end customer.

The players are able to negotiate and form contracts inside the game interface. Groups can also see each others emails and are encouraged to contact other companies by email for more detailed negotiation. The game interface offers three main tools for forming contracts. Companies that need a variable can contact companies that produce these variables via RFP (request for proposal), where they outline what they need and what terms they would be interested in. Companies that provide variables can send offers to companies need these variables. Offers have set conditions, such as the sell price for the variable, contract length. The buying party can then accept or decline the offer. If an offer is accepted, a contract is automatically drafted based on conditions in the offer. Contracts are the last tool in the game for network forming. Variables and money are moved automatically in round three based on the contracts. Two companies can dissolve a contract between them if they both mutually agree to it for no charge. One party can also simply break the contract but this will incur a contract break penalty agreed upon in the original offer.

The second round emphasizes heavy communication, both inside the group

and between groups. The group has to first discuss among themselves what kind of partners they want to look for. Then they need to actually search for and contact companies they are interested in working with. Usually companies have negotiations with multiple other companies at the same time. As was mentioned in the literature chapter, inter-student communication is an important factor for keeping students active in an online course. And the communication does not stop after the negotiation phase. As the values selected by companies all together form the final service, it is important that the network communicates all the time so they can end up with a product they were aiming for.

Launch IT

Change

Remove

STATUS: Contract dissolved. Waiting for new offers

Timeline

Contract

Show the contract

EXPIRED

Sent 15/10/2015 18:26

Offer

Sent 15/10/2015 18:26

Duration: 1
Offer:40 launches for \$1 000 000
Reason for rejection:

Hello, Thank you for your cooperation last year. According to our situation in the previous years and the APAC market situation, to the fourth fiscal year we are planning to reduce even more the number of launches. We are looking forward to work with you again. Sincerely Yours, LaunchIT Team

Contract

Show the contract

EXPIRED

Sent 09/10/2015 14:38

Offer

Sent 09/10/2015 14:38

Duration: 1
Offer:80 launches for \$1 125 000
Reason for rejection:

Hello, Thank you for your cooperation last year. According to our situation in the previous year, to the third fiscal year we are planning to reduce the number of launches. We thought that maybe our bad situation is due to the low quality of customer operations, which may had been lower than expected. We are looking forward to work with you again. Sincerely Yours, LaunchIT Team

RFP

Sent 07/10/2015 22:22

Hi, What is your status? Thank you. Best Regards, Escape Velocity

RFP

Sent 07/10/2015 22:22

Hi, our company has started an internal audit and is just trying to figure out what happened last FY. What is your insight on the current situation (why we failed both in terms of launches and capacity utilization)? Obviously, price can't be the only issue. How quality driven is the rest of the supply chain? Your input is highly appreciated. Thank you. BR, Escape Velocity

Figure 3.3: An example of the negotiation tree inside the game

Third round consists of sub rounds that simulate fiscal years. Admins can set deadlines for the fiscal years, and after the deadline passes, the fiscal year is simulated. This means simulating sales for all the customer-facing companies that are part of a functional network. All contracts will also be automatically enforced and if they have a duration agreed, the duration is reduced with one year. After the results have been calculated, a report of that fiscal year is drafted for all companies. The players can then look at this report to see how their company and their network performed that fiscal year. The in-game clock then starts counting towards the next fiscal year timeline and during this time players are free to make changes to their company attributes and forge new contracts, all in order to do better the next fiscal year. Indeed, as contracts with other companies have limited duration, groups might themselves forced to negotiate new contracts during round three.

After all fiscal years have been played, the game calculates final results. All companies that part of a highest earning network are considered winners. This is done to motivate students to consider co-operation and network health over simply trying to maximize profits for their own company.

The third round of the game can be considered the fun "game" round, where the companies are actually selling their products and reacting to results. The players receive a report after every fiscal year, which gives them lot of feedback to work on. As mentioned by Garris and Driskell, in a good educational game objectives in the game are tied to the learning goals. [(Garris and Driskell 2002). This manifests in the NSBG through the markets present in the game. The admins can change and tweak how the different markets in the game react to different variables. This allows the course staff to emphasize different aspect of service business, such as pricing or quality, as they wish. For instance, to emphasize the importance of quality in service business, the course staff can make the quality requirement of all markets very high. As students receive reports from the game and tweak their numbers, they naturally gravitate towards increased quality. This allows for so called stealth learning, as students learn by just completing the objectives in the game. The constant feedback that students get from the reports makes the game and the changes easy to understand and keeps students motivated in the game.

All-in-Awe's results

Current year	5
Company type	Sales and Marketing
Working Capital (\$)	79 748 360
Revenue generated last year (\$)	27 840 000
Profit earned last fiscal year (\$)	-22 796 580
Profit earned before tax and interest (\$)	-22 796 580
Total profit earned during game (\$)	34 748 360
Launches made last year:	32
Primary market	EMEA
Supply chains:	EMEA
Sell price:	580 000
Sales made last year	48
Owner:	Group 2
Specific market data	
EMEA	
Amount of launches in market	32
Customer satisfaction in market	1.50
Americas	
Amount of launches in market	-
Customer satisfaction in market	-
APAC	
Amount of launches in market	-
Customer satisfaction in market	-

Show detailed reports

Ranking: 1 / 7

Statistics

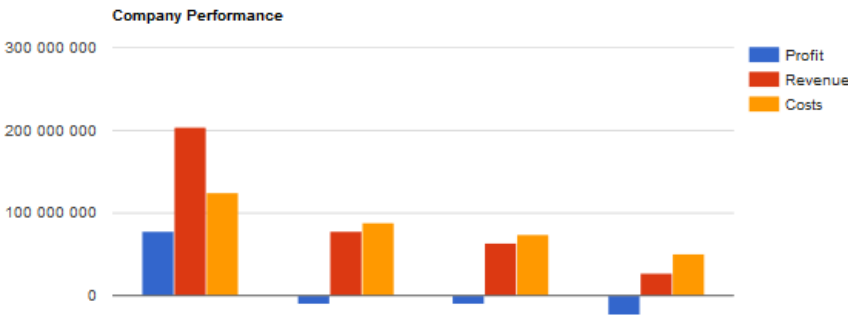


Figure 3.4: The report page companies can view after every fiscal year

Chapter 4

Material and methods

Material and methods

During the Aalto Introduction to Services -course, students kept a learning diary. Keeping a learning diary was optional in the first year and mandatory in the following year. In these learning diaries the students wrote about the actions that they took during the game and their justifications for these actions. Students also wrote comments and feedback about the game itself. For later years, when the learning diary was mandatory, it accounted for 50

I gathered 93 learning diaries from the course, from a span of three years. Out of these 93 diaries, 55 diaries were finally kept. Others had to be discarded due to formatting errors which caused them to not work with the selected method. All selected learning diaries were either in .doc or .pdf format. These diaries were then converted into pure text format and then separated into single sentences with a ruby script. All sentences were then run through sentiment analysis and divided into positive and negative sentences. For sentiment analysis, a ruby gem, called Sentimentalizer, by Malav Bhavsar was used. (<https://github.com/malavbhavsar/sentimentalizer>) Afterwards, some edgecase sentences were manually divided into positive and negative categories.

After the sentences had been divided into positive and negative categories, they were manually gone over in order to search for motivational factors. Sentences where students directly talked about their motivation in relation to something, or where motivation could be inferred from the sentence were selected and categorized. In the end, six different categories with most hits were selected for the purposes of this study. These six categories were: Games as Education Communication Feedback Game implementation and game logic Team work Simulation

After the sentences had been divided into categories the number of hits, i.e, the number of sentences in each category is calculated. Positive and negative hits are also calculated separately. The total amount of hits indicates how important that category is for the motivation of students in the course. The ratio of positive and negative hits on the other hand tells us how well the business game has managed to handle that category.

4.1 Sentiment Analysis

The basic idea of sentiment analysis, also known as opinion mining, is to infer the attitude of a text segment towards certain topic or object. More specifically whether the attitude is positive, negative or neutral. It can be used for other purposes as well, such as trying to understand the writer's emotions when they were writing the text segment. However, in this study, only the polarity of the sentences was analyzed.

There are multiple applications for sentiment analysis. Companies are often interested how people feel about their products and services etc. Other possible applications include for instance gauging opinions in elections, or showing people's opinion about a product to potential buyers through analyzed product reviews. (Liu 2012)

Choosing the right keywords for analysis can be difficult. Even deciding the keywords manually might not be a good option. Paper by Pang and Lee has an adapted chart from earlier research that shows applying machine learning techniques on unigram models achieves better accuracy in correctly analyzing sentences than human selected keywords does.(Pang and Lee 2008) In this study, the default keyword library that came with the Sentimentalizer gem was used.

There are multiple levels of sentiment analysis.

Document level analysis infers whether the opinion of the whole document is positive or negative [opinion mining]. It can be used for instance to analyze product reviews to see if the reviewer holds positive or negative view about the product. Document level analysis assumes that the whole document has an opinion on a single subject and thus is not applicable when the document considers multiple subjects (Pang and Lee 2008).

Sentence level analysis analyzed single sentences and determines whether that sentence is positive, negative or neutral. Neutral usually means no opinion (Pang and Lee 2008). This study used sentence level analysis. Neutral sentences were discarded during the analysis.

Neither document level analysis or sentence level analysis tells you what exactly is it that people like or dislike. As the last level of analysis there is Aspect level that does a more fine grained analysis. Whereas document and sentence level look at language constructs, aspect level looks directly at the opinion. But while document and sentence level classifications are already difficult, aspect level analysis is even more difficult.(Pang and Lee 2008)

One of the reasons for using sentiment analysis for this thesis was that, while sentiment analysis is already used for multiple applications (Liu 2012), it hasn't been used for this kind motivation analysis. Thus it might reveal motivational factors that other studies have been unavailable to find. It is also a good method for organizing the data from the learning diaries, as their sheer amount would make analyzing them by hand a cumbersome task.

Chapter 5

Results

Results

In the end, I obtained 189 sentences where a motivational factor was inferable from the sentence. Out of these 189 sentences 119 were classified as positive sentences and 70 were classified as negative. Out of these 189 sentences emerged the six categories that are important for motivation mentioned in the material and methods chapter.

Category	Hits	Meaning	Example
Games as education	54	How students feel about using games as an educational tool	"I am happy that different kind of teaching methods are tried out, and I am enthusiastic to try, and do something new"
Communication	23	Information channels and flow between students and course staff	"As mentioned above, real-time communication was critical to staying in the game"
Feedback	15	Feedback that the students receive both from the game and from course staff	"But I still felt like it would have needed more clear guidance, and especially feedback and explanations for the results"
Game implementation & logic	49	How the game is actually implemented and what design choices are made	"I think the negotiations were extremely interesting and the best part of the game naturally"
Group work	28	How both working as a group and being divided into groups by the course staff affected motivation	"Having people from three different Aalto schools, excited me, and I was expecting to learn a lot from the other students"
Simulation	22	How immersiveness and relevance to course learning goals affected student motivation	"All in all, I found the game very interesting because we were able to tie our learnings from the classes with practical matters"

The number of hits in each category shows how important that category was the students motivation. Few categories, namely 'Online element' and 'User Interface' were discarded due to low number of hits. This does not necessarily mean that these categories are not important for motivation. Indeed, one

might think that user interface can play a very important role in motivation. It might simply be that students did not think to talk about these things in the learning diaries.

As can be seen from the table, the "Games as education" -category was clearly the most important. This category shows what the students felt about using a business game as a teaching tool in a hybrid course. Also, the "Game implementation/logic" category received a lot of hits as well. The evenly split positive and negative hits will be analyzed later but the number of hits tells that how the game is implemented plays a huge role in the success of the educational game. The other categories that emerged seem to match the existing literature about what factors are important for motivation in an online course.

5.1 Games as education

	Positive	Negative	Total
Hits	49	3	54

Example lines	
Positive:	<p>"This was an interesting course and definitely different from the other courses I have taken by this far"</p> <p>"I am happy that different kind of teaching methods are tried out, and I am enthusiastic to try, and do something new"</p> <p>"I really think there should be more this kind of games in universities to make learning more interesting and realistic"</p>
Negative:	<p>"Unfortunately I did not understand what the point of this game was"</p>

"Games as education" category contains all the of the selected sentences where students talk about their feelings regarding using the business game for educational purposes. It tells us how the students who enrolled on the course feel about using games for education, regardless of how the actual game is implemented. Most of the sentences selected to this category were from the start of the diaries, when the students hadn't yet played the game.

There are multiple reasons for considering educational games as new means of education. First of all, gaming is very widespread these days (Papastergiou 2009). This lessens the possible problem of the medium being too alien to students, which could inhibit learning. Educational games have also been shown to increase performance levels when used on courses. (Kebritchi et al. 2010) And as we can see in the next chapter, their effect on student motivation is also considerable.

As mentioned earlier "Games as education" was the most popular category with 54 hits. On top that, majority of these hits, 51, were positive. It is quite obvious from these results that most of the students were excited about the course and interested in the game. Even the three negative hits might simply be from a unsatisfactory experience with the game itself.

5.2 Communication

	Positive	Negative	Total
Hits	16	7	23

Example lines	
Positive:	<p>"Game FB group worked very well! That was very pleasant experience"</p> <p>"As mentioned above, real-time communication was critical to staying in the game"</p> <p>"I thought that it was great that there was the Facebook group used for fast communication, and at first was actually really positively surprised with it"</p>
Negative:	<p>"I would still recommend to use another platform or application than Facebook, It is difficult to follow all the discussions and comments during the whole game"</p> <p>"I also found it difficult to follow the game and instructions because the information was so wide-spread"</p>

This category measures the effects of communication and selected communication channels on student motivation. On top of that, sentences dealing with how information was delivered on the course were also placed to this category.

Research has shown communication, and especially relationship with between the students and faculty, to be very important for motivation (Clayton et al. 2010a) and the results in this thesis seem to agree with that.

While it hasn't received as many hits as some of the top categories, communication still received enough hits that it can be considered relevant. There are considerably more positive hits than negative so it seems the Network Service Business Game has succeeded in its communication channels.

Network Business Game had a Facebook page which allowed students to talk about the game and especially ask questions regarding it. The gamemaster for the game was also often online in the facebook group to answer questions about the game. This was highly appreciated by the students and many of the positive hits were talking about how motivating it was to receive answers to questions immediately in real time. Many of the negative hits were about information being too widespread. One student complained that he had to look for information to his problem from a three different sources before he got the answer.

While the use of Facebook was almost uniformly appreciated by students, Facebook as the communication tool split opinions. Some students enjoyed it since it was familiar to them and thus easy-to-use. Others liked it because it seemed to work smoothly and serve its purpose. But some students felt that Facebook is something they want to use for their private life and not for this kind of things. Some students also wished for a real time communication channel to be implemented inside the game.

5.3 Feedback

	Positive	Negative	Total
Hits	5	10	15

Example lines	
Positive:	<p>"Something I did enjoy, was reading the reports"</p> <p>"The feeling after the pitch was very good! We got good feedback so the effort was rewarded"</p>
Negative:	<p>"In this [pitch] feedback we just got humiliated"</p> <p>"But I still felt like it would have needed more clear guidance, and especially feedback and explanations for the results"</p> <p>"The impact of that feedback [from the pitch] was that we lost our motivation totally"</p>

This category contains sentences that deal with the feedback received from the game. This includes both feedback received from the faculty and automatic feedback received from the game. Students receive feedback from the course staff during the first round. After they fill their Business Model Canvas, it is graded by the course staff who will also then write feedback about it. Also on the third year of the course there was also a live "pitch" event. In the event the students had to pitch their company to a live audience consisting of course staff. After the pitch event, the students received live feedback about their pitch. The students also naturally receive feedback from the game itself. The most basic feedback the game gives is simply showing the statistics of the company. How much revenue and sales they have made, are they making profit etc. On top of this, the game also generated extended reports after every fiscal year. The students can study these reports to understand how they should adapt to the following fiscal years.

Garris and Driskell mention in their paper that feedback is an important part of the judgement-behavior-feedback cycle. Individual behavior is often directed by comparison of feedback to goals. If given correctly, the feedback can drive the player to improve their performance, thus increasing motivation and engagement to the game. (Garris and Driskell 2002)

Feedback had the least amount of hits from all categories but still a respectable amount. The positive hits were mostly about how seeing the success of your company in the game is motivating. Also some of the comments mention that reading the reports from previous years was motivating because they could better prepare for the next year. This was also one of the categories that had more negative hits than positive hits. This however is mostly due to the pitch event held during third year. Many students felt that the feedback from the pitch session was needlessly harsh. This clearly negatively

affected many of the students participating in the pitch. There were also some requests for more feedback, highlighting the importance of feedback for student motivation.

5.4 Game implementation and logic

	Positive	Negative	Total
Hits	21	28	49

Example lines	
Positive:	<p>"It was very nice that we were given freedom, how to negotiate and which instruments to use"</p> <p>"I think the negotiations were extremely interesting and the best part of the game naturally"</p> <p>"The fact that you had to think of the benefit of all the companies in the ecosystem was also exciting, and really different from what I've used to in the business school"</p>
Negative:	<p>"It would had made the game more interesting and more interactive if there were more company specific options that could be played around in a more agile way"</p> <p>"However, to keep motivate students and relate the game to the study concept, I think more features should be added"</p> <p>"One of the limiting factors was that everyone was online at different times and the function of limiting the ability to send out RFPs, so that every group member has to have the same amount, turned out to be really annoying"</p>

Like was mentioned in the literature chapter, the actual implementation of the game is also very important for motivation. Even if you take time to consider all the other categories, but your game is not engaging or fun to play, players will not be motivated to finish the game. Thus, this category measures just how important game implementation and game logic is for motivation. I also tried to find various motivational factors related to game implementation.

According to previous research, students who are familiar with games often anticipate same level of quality from educational games as they do from normal games. (Papastergiou 2009) This can be time- and resource-consuming, and sometimes even impossible but it is something that should be considered when designing an educational game. This fact might also explain some of the negative hits in this category.

This category had the second most number of hits from all categories. However, due to how the game diaries were written, it might just be that the students are more likely to mention things related to the game logic rather than other categories. Nevertheless, the large amount of hits proves the results from other literature, that the game implementation is very important for motivation in educational games. One of the most prominent subject of positive hits was the negotiation process that is prevalent through the game. Students seem to really enjoy having to negotiate with other actual players. There was also praise for the complex nature of the game and the freedom it provided. As players are able to select their market, what kind of service they wish to provide and the partners they want, there is much freedom in how to play the game. This complexity can also have a negative effect on motivation however, since few students felt that the game didn't explain itself well enough and was too complex. It might be possible to mitigate this effect by having enough instructions but at the same time, if the game is too complex, it might not be possible to have succinct yet encompassing instructions. Complex and hard to read instructions can themselves be a source of frustration for players, eating motivation. The game implementation and logic was also one of the categories that received more negative than positive hits. However, a majority of these negative hits were directed at one single subject. That subject is the "account manager" system found in the game. The account manager system is used to make sure that all students participate in the game evenly. When the company is starting negotiations with another company, they must select an account manager for that negotiation from inside their group. The account manager is the only then, who is able to move the negotiations forward inside the game platform. Account manager roles must always be evenly divided, so if Player A has two account manager roles and Player B and Player C both have one, Player A cannot accept new account manager roles until B and C have accepted one. This forces all group members to have around the same amount of negotiations, thus distributing the workload evenly. Most players however felt that this system was far too inflexible and hand-tying. Many students expressed frustration over not being able to become account managers for negotiations they themselves originally started through email or face-to-face connection. There

were also cases where students were highly stressed when they were ready to finalize a contract but the account manager from one of the teams was missing. Indeed, many students simply ended sharing their login information so that any member of the group can handle any contract. This shows that this kind of forced participation might have a negative effect on motivation. However, at the same time, some method of evening the workload inside a group should be used, as the next result category will show.

5.5 Group work

	Positive	Negative	Total
Hits	14	14	28

Example lines	
Positive:	<div>"I am very pleased of the performance of our group and I need to say that I was fortunate of having such good members in our group"</div> <div>"Having people from three different Aalto schools, excited me, and I was expecting to learn a lot from the other students"</div> <div>"Group work with students with different educational background is one of the highlights of the game and provides very valuable learning opportunities"</div>
Negative:	<div>"Practically my team mates didn't participate into any ecosystem meetings, significant effort had to be put to force them to write their part of the paper trail, and they had to be asked in order to get opinions and suggestions out from them"</div> <div>"Unfortunately I also felt that all the tasks were done alone by me: like create accounts, write company description, ask, inform and so on"</div> <div>"I know this sound harsh but I've studied in Aalto for six years now and I don't remember a single positive group work situation"</div>

This category measures the effects of working as a group on motivation. Motivation in group work has been studied before but here we wanted to

especially see the effects of group work in an educational game setting. It is also worth noting that the students were not free to choose the group themselves but instead were divided into groups by the course staff. This should be considered when analyzing results as allowing to students create their own groups would probably have resulted in different kind of results altogether.

Traditionally group work has been seen as having a great effect on motivation in education. Group work can be seen as a learning experience which maximizes the effects of peer collaboration. Group work has been noted to increase self-efficacy and confidence, learning to increased motivation (Dornye 1997). Self-efficacy and confidence have also been linked to increased motivation in online courses in another study (Clayton et al. 2010a). However, literature on group work specifically in online environments seem to not exist.

With 28 hits, group work was among the higher categories. This shows that one way or another, forcing the students to work in groups has a strong effect on motivation. As can be seen from the table, the positive and negative hits for this category are split perfectly even. Group work seems to split opinions pretty hard as far as motivation is concerned. Many students seemed to like group work and enjoyed working as a team with a single goal. This kind of a team mentality might help motivation, because the student might feel that if he does not try hard enough, he will let other team members down. Some also expressed that the multi-background teams created by the course staff were refreshing and it felt good to work with people you don't normally work with. On the other hand, some students did not like the premade groups at all. They felt that they were grouped with people they are incompatible with. This caused a lot of frustration and stress for these students. Also some students simply hated group work in general and would have preferred to work alone. As a special note, there were few negative hits where students lowered motivation was result of having so called "free-riders" in the group. That is, group members that the student in question felt didn't do their share of the work. Free-riders can be a problem in any group work and that can understandably be frustrating. It is worth noting that the game tried to mitigate this problem with the earlier mentioned account manager -system. But as can be seen from complaints in both categories, this attempt was not entirely successful.

5.6 Simulation

	Positive	Negative	Total
Hits	14	8	22

Example lines	
Positive:	<p>"All in all, I found the game very interesting because we were able to tie our learnings from the classes with practical matters"</p> <p>"This gamified way was indeed a nice learning approach to understand how service providers cooperate and build together the service and customer value"</p> <p>"Firstly have to say that it was a great game for us to practice our skills and get an understanding of the nature of service business, glad to have the chance to participate"</p>
Negative:	<p>"It would maybe have been more educational to have something more realistic"</p> <p>"I don't really feel the strong connection about the game and the course material, to be honest"</p> <p>"I understand it is a game but sometimes I got really frustrated with this part [unrealisticness] of the game"</p>

As mentioned in the literature chapter, educational games are more effective when they are immersive and the learning happens through so called "stealth learning" as students play the game. This category measures how immersive the students felt the game to be and how that affects their motivation. It also measures how well the students feel that the game connected to the lectures and how meaningful the students found the game.

The good number of hits in this category together with the fact that most of them are positive shows that immersion indeed seems to be an important source for motivation. Many of the positive hits mentioned how they learned things about courses learning goals, such as service business, business networking and so on, simply by playing the game. Some of the negative hits feel that while the game might have matched the learning goals of the course, it still felt disconnected from the actual lectures in the course. It would seem that if a educational game is implemented in a hybrid course,

it is not enough to consider the relationship between learning goals and the game, and learning goals and the lectures but you should also consider the relationship between the game and the lectures. A few students also felt that the game was still too unrealistic and that lessened their enjoyment and motivation. This tells us two things. First of all, that the realisticness and immersiveness of the game is indeed important but also that immersiveness is not an objective scale. What might have felt immersive and realistic to some of the students, might have felt completely unrealistic to others.

Chapter 6

Discussion

The results in this paper mostly align with the results of previous research. Based on the literature review we can definitely say that motivation is very important in online courses. Also, based on the amount of positive hits regarding educational games we can say that educational games can indeed be used for improving motivation in online courses. Finally, the motivational factors that rose up in this study were in many parts similar as in previous studies, and will be gone over in detail in the next segment.

The most important part from the results was the excitement the students had towards the business game. The Games as education category had both the most hits and the most positive hits. This shows that students are interested in the idea of using games as education and are motivated to try them. It will be up to the course staff then to produce an educational game that is of high enough quality to match student expectations. This kind of excitement is sure to have positive effect on motivation, and thus educational games should especially be considered in online courses where motivation can be hard to achieve.

One of the problems of online courses is that it is harder for students to discuss face to face with course staff. As mentioned in the literature chapter, this lack of communication can lead to decreased motivation. The paper by Clayton et al. found out that students want learning environments that promote among other things 'direct communication with professor(s) and students' and 'relationships with faculty and students' (Clayton et al. 2010b). This is confirmed by results in this thesis. Communication was a key factor for students' motivation. Students were especially appreciative of the real time communication channels provided by the course. As such, online courses, even ones that do not include an educational game, should strongly consider

having a real time communication channel for contacting the course staff and having course staff be on call on that channel as much as possible. For educational games, a real time communication channel inside the game seems to be the best option. This would naturally mean that course staff should try to be online in the game platform when possible.

Results on feedback also matched with the existing literature. Feedback is very important for motivation. Especially, lack of feedback can be very demoralizing for students. Online courses and educational games can both be complex and their combination especially so. In such a complex environment, it can be very frustrating if you do not receive enough feedback to understand the effect of your actions. Garris and Driskell mention in their paper that feedback can have both positive and negative effect on performance but that its effect on motivation is more clear. (Garris and Driskell 2002) It is, however, worth noting from the results that many of the negative hits didn't come from lack of feedback but from feedback that the students found unfair. Many students felt that the pitch event in the third year of the course gave feedback that was not useful. It was considered unfair and even mean. Thus, it is not enough to only think about when to give feedback but also how the feedback should be formed and given to students. Bad feedback can be just as demoralizing as no feedback at all.

It is difficult to come into any kind of conclusion regarding results in the group work category, as the opinions were so clearly split even. It seems that whether a game will have group work or not does not matter as some of the students will be disappointed if it does and some will be disappointed if it doesn't. Perhaps the best solution might be providing the option to either work as a group or work alone, so that students could choose which one they prefer. This might be difficult to implement in practice however, depending on the game. One thing that should at least be considered is that if group work is selected over individual work, steps should be taken to negate the possibility of free-riding. This would lessen some of the problems with group work and could thus possibly reach to best possible outcome as far as motivation is considered. While previous research on group work in an education environment has found out that group work has a positive effect on education in general (Dornye 1997), the online/hybrid course environment is vastly different from the traditional. As we can see from the results, free-riding is a problem that especially lowered motivation during the Network Service Business Game. Free-riding is a more serious problem during online courses as the students might not be able to confront the guilty party. Thus, I believe that group work in online/hybrid course setting should receive more specific research before any conclusions can be made.

The results gained in this paper also confirm the fact that immersiveness and relevance of the learning goals are both important factors for motivation. As Bizzocchi and Paras mentioned in their paper, participation in the game is most effective when the students are completely immersed in the game. (Bizzocchi and Paras 2005) Based on the hits received in this category, students seemed to enjoy the game more when they were immersed. In round 2, even though the students are just playing a game, the negotiations with other groups are still real. And it is these negotiations that generally received most praise from the students. This kind of immersion driven excitement is sure to have positive effect on motivation as well. While immersion is important, it is also important to connect the game into both lectures and learning goals. This was also noted in the paper by Garris and Driskell. In their paper, they propose a debriefing process to link game cycles and learning outcomes. (Garris and Driskell 2002) The players can feel disillusioned if they feel no connection between the game and what they are trying to learn. In Network Business Game, the reports received after each in-game fiscal year can be considered as debriefing processes. Finally, it is good to remember that both how immersive the game feels and relevance are subjective things. In the results of this paper there were hits where students praised how the game was really well tied with learning goals and felt immersive but also hits where the students felt that the game didn't really tie into the learning goals and that it was too unrealistic.

Obviously no matter how excited the students are for the game, it has to be implemented well enough to keep students interested in it. One thing that really seems to increase motivation is providing enough freedom in the game. With enough freedom, the students are able to device their own solutions for the problems in the game. This keeps the game interesting for students and keeps them motivated to the game. Of course, with increased freedom comes increased complexity. As the complexity of the game grows, it becomes harder for the students to dive in and start playing. For a complex game, proper, easy-to-read instructions are a must. But even with good instructions, a game can only be so complex before it becomes too hard for players to engage in, decreasing motivation of students. Thus, a good balance between freedom and complexity must be found in order to create a good educational game.

Another thing worth noting is that while free-riders can be problem in a group work setting, great care should be taken when designing a solution for this problem. In the Networked Service Business Game, the solution was to use the account manager system. This forced all players to participate or the group could not move forward. This, however, was not well received by the

students. Many felt that it didn't help with the actual free-rider problem and instead simply made the game very stressful as their success was dependant on a person they could not reach. Many students simply circumnavigated the problem by sharing account information. This also reveals us a new point worth considering. Many students mention how stressed about the fact they were that they were ready to proceed but something (in this case not being able to reach team members) stopped them from proceeding. Therefore it would be optimal if the the players would be able to proceed in the game at their own pace. It is, of course, difficult to implement this in a group work setting. But at least preventing the whole group from proceeding because of a one student seems to cause more frustration than helping.

Another thing that split the opinions in the results was whether success in the game should affect grading on the course. This is simple if success in game is directly tied to learning goals, like in some kind of quiz or something. But it is more complicated if the game is wider in scope. For instance the Networked Service Business Game is attempting to simulate the business environment of a networked service ecosystem. In such an environment, there are multiple unknown variables. Thus, it is possible for player to play as well as they can based on the knowledge they have, but still end up with suboptimal results. It might not be fair to grade the course based on success in this kind of situations. That is why the Network Service Business Game has other aspects that affect the grading, such as the business model canvas. While some students were happy about this decision, others commented that they were demotivated by the fact that their company's results won't affect their grade. In a more complicated game, where game results might be difficult or unfair to directly transform into grades, some kind of an incentive system could be used instead. That way failure would not be punished but succeed would be rewarded, making everyone happy.

As the found factors were mostly in line with existing literature, using sentiment analysis as the analysis tool didn't really bring out anything new. It did, however, serve its main purpose which was to make the analyzing of large amounts of text easier.

Chapter 7

Conclusions

After analyzing 55 learning diaries, we came up with 6 six categories. Some of these categories can directly be considered motivational factors. Communication, Feedback and group work are motivational factors on their own. Other motivational factors can be extracted from the categories. From the results of the Games as Education -category we can see that freshness and new methods of education are a factor that many students react very positively to. From the game implementation -category we notice that freedom and flexibility are important motivational factors in online games. It was also evident that the stress of failing objectives due to teammate absence, created by the account manager system, had a large negative effect on motivation. Finally, we can see that success in the game is a positive motivational factor, though the opinions are split on whether it should affect the grade. Final category that emerged from the results was Simulation. From it we can extract realism and relevance to learning goals and possible lectures as motivational lectures. Relevance is surely important for online courses in general, while as realism is mostly factor for educational games. These were the motivational factors found during this thesis.

The importance of these factors can be seen from the hits that their categories received. Large amounts of hits means that category is important for students, whether in positive or negative sense. Games as a new novel way of education can be seen as a huge, important factor. The amount of hits and the example phrases in the category show this. Students were really excited to try out an educational game. It was also evident that the actual implementation of the game is very important when it comes to educational games. Especially the relevance to the learning goals of the course was seen as an important motivational factors. Communication and feedback on the

other hand seem to be somewhat important factors in both online education and educational games. Feedback is easy to implement in an educational game as the game can show live feedback as the player plays the game. Due to its importance as a motivational factor, it is something developers should always keep in mind. While group work received a large amount of hits, the opinions were split basically even. This makes group work a difficult factor because it is clearly an important factor. However, acting on it can be difficult as students have such different opinions on it. It is also important to note that this thesis can only say how important the factors that were found are. There could very well be important factors that didn't come up in the learning diaries and were thus not found in this thesis.

Regarding the final research question, I believe that educational games can most definitely be used to improve online courses. As discussed in this thesis, proportionally large drop out numbers and lack of motivation plague online courses. But as we can see from the results of this thesis, students show a large amount of interest in using educational games as an educational tool. It is also worth noting that many of the motivational factors discovered in this thesis can emerge naturally from playing an educational game. Especially feedback is something that can be naturally and easily implemented in the game. However, it is also worth noting that making a proper educational game is no small undertaking. Thus, they may not be optimal for small or short online courses. But especially for longer courses with large amount of students, they are something that should be seriously considered.

7.1 Future work

One possible venue for future research is educational game implementation. We have shown in this paper that educational games are both a valid tool for increasing student motivation in online courses and a thing that students are very interested about. However, while educational game implementation was lightly touched in this thesis, more research into it would be needed to truly be able to create engaging and efficient educational games. While it is important to understand motivational factors when designing the games, it is merely one facet of it.

Another thing related to motivational factor worth studying more is group work. In this thesis it was very difficult to come into any definite conclusions about group work in educational game or online course setting due to to even split in the results. It is clear however, that group work is important

for motivation, one way or another. Some of negative comments about group work were about free-riding group members. This could be mitigated with a system that punishes free-riders and makes sure that everyone in the group has to participate equally. This can be difficult however, as was seen from the account manager system in the Network Service Business Game. Also many of the negative comments were about group work in general. It might be difficult to mitigate these problems, other than offering the possibility of solo work. Thus, more research about the motivational effects of group work in online environment would be good.

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Appendix A

Appendices

A.1 Categories

A.1.1 Games as education

Positive: "I am happy to know that in the future new students are given more and more opportunities like this to cooperate and explore topical themes from many aspects"

"At this point, I am pleased I had the chance to get familiar with an Aalto course and alternative teaching methods, and learn and recap themes concerning one of my favorite topics, service science"

"I think this technically the game is already very good for learning purposes"

"the game was a little bit laborious but also a rewarding learning platform"

"At first I have to say that this Aalto Network Service Business Game was a very pleasant surprise for me when I heard from it for the first time"

"The game was really worth of playing and Aalto Introduction to Services has very much potential to be one of the most interesting courses in Aalto University"

"I will recommend this course to my friends from Aalto Business School"

"This is the third university, where I have studied so far, and this is the first course, where I have faced this kind of a learning method"

"It was a good way to learn about many different things, such as communication, bidding, negotiation strategy and so on"

"Of course these things were on very basic level, but still I think that this

game was a good platform to utilize the things that we have learned during our courses so far”

”Im not so sure, how well it was linked with the topics of the course, but in general it was a learning experience”

”In conclusion, this game was an interesting way of learning and I think that if you develop this further, you will in future get much more positive feedback”

”This kind of a game is a great way to learn, but this time it had some major drawbacks” (Positive and negative)

”Comments All in all, our team enjoyed playing the NSB-game”

”Despite from the small problems and bugs, the game worked pretty well and in the end it was both educational and fun at the same time” ”All in all, I found the game very interesting because we were able to tie our learnings from the classes with practical matters”

”Even though the game required quite a bit of work, I was very happy to have it as part of the course”

”I think it brought learning to a whole new level and showed a new way students can collaborate, especially between the universities (TKK and HSE)”

”In general I liked this different method of learning during the course, although the lectures during the course did support the game only at minimal level” (pos and neg)

”For me the game seemed interesting from the very beginning of the course, although at first I had to read all the material through for a few times until I understood what the game was all about”

”This was an interesting course and definitely different from the other courses I have taken by this far”

”Here in the beginning I want to say that I was very excited about the course”

”For me the game taught plenty about team work and networking”

”Still on overall I think that the game was good and we had plenty of fun participating and working together as a team and as an ecosystem”

”FINALLY The game is an interesting idea and a novel way of course work, but at the moment it does not give the students awfully much in any sense” (positive/negative)

”I am happy that different kind of teaching methods are tried out, and I am enthusiastic to try, and do something new”

”First steps I am truly excited about the opportunity to play a business game!

I registered early and it was very easy”

”Looking back All in all I think a business game is a nice addition to more traditional means of learning”

”I enjoyed this game a lot”

”I really think there should be more this kind of games in universities to make learning more interesting and realistic”

”This gamified way was indeed a nice learning approach to understand how service providers cooperate and build together the service and customer value”

”Overall, I think gamified way of learning is indeed a good solution for a group assignment”

”Overall the idea of an online game on creating service networks is really good and innovative”

”I was very excited before the game opening lecture”

”Overall I think it was an interesting game, but a little more focus on the service and options affecting it”

”Interesting course, I liked the game as a learning tool a lot”

”All in all I found the game interesting and it was well constructed”

”With little improvements such as better instructions and better user experience, this game would be perfect for learning”

”This course sure was something that doesnt come along very often especially in the business school, so that is why I found this course very refreshing”

”No matter how the result is, it is a good experience and I learnt a lot from the game”

”Finally someone had thought to make learning fun!”

”The idea of teaching through a game is amazing”

”Even though some bugs occurred during the game, still the game itself was excellent”

”It was an interesting idea to have a game as a group work”

”As an academic experience the game was not that demanding but it was fun and addictive at times”

”and I really had fun doing/playing it, and also learned from these previous issues”

"When it was announced on the beginning of the course that we will have a practical game that simulates the real business world, I felt very excited and was looking forward to start playing the game"

"Personally, I like the game, it is much better than sit still in the lecture and absorb all the articles"

"As a conclusion, I really liked this game, it gives you a lot of food for your brain"

""Personally I feel this is a great way to teach because it is so interactive"

Negative: "In the beginning of the course I was really excited about the whole game and that it would be both interesting and fun to play it, but this changed quickly"

"The crazy schedule, meaningless and time-consuming tasks and poor instructions in addition to very loose linking to the course topics makes the game a rather unsatisfactory learning experience of very little value"

"Unfortunately I did not understand what the point of this game was"

A.1.2 Online element

Positive: "The platform was accessible anywhere and anytime, which was a positive thing"

"Overall the idea of an online game on creating service networks is really good and innovative"

A.1.3 Communication

Positive: "I highly respect the game master that had linked his own profile to this group, and personally answered the messages even on Sundays"

"Also Game Master answered very fast questions of students, which was a very good thing"

"Lectures were very informative and cases were excellent and demonstrating especially on the lecture of Service Business Models"

"Even though I have used Doodle on some courses to plan schedules for face-to-face meetings this time FB worked very well, thanks to other CEOs who were equally active and flexible"

"Game FB group worked very well! That was very pleasant experience"

"On a positive note, a game organizer would reply to a post in the Facebook group almost instantaneously, This greatly facilitated playing the game whenever a question or problem presented itself"

"As mentioned above, real-time communication was critical to staying in the game"

"Was also nice that questions were answered fast"

"Also it was good to follow the discussions of other course members and to see the game related issues real time"

"The day before the deadline, one part of our business mode canvas was still empty and we contacted the game master to get him kicked out which happened very efficiently"

"Fast response of questionair"

"I thought that it was great that there was the Facebook group used for fast communication, and at first was actually really positively surprised with it"

"I also like the fact that questions and feedback could be given throughout the game in Facebook"

"In addition, Hkan answered quickly to our questions, which was extremely helpful"

"This [Facebook] made the communications flexible and easy and more importantly available for everyone"

"Asking for help has never been this easy and fast!"

Negative: "However, the Facebook group is definitely not the best channel for communicating this type of fixed information, since the messages get buried under new messages"

"I think that the instructions of the pitch day could have been clearer"

"For example I noticed that the area of responsibility for a ground operation company was not clear for all students on the course"

"It wasnt always clear, where to look for the information"

"I would suggest a communication platform inside the game that participants could talk, send messages and reply inside the game"

"I also found it difficult to follow the game and instructions because the information was so wide-spread"

"I would still recommend to use another platform or application than Facebook, It is difficult to follow all the discussions and comments during the

whole game”

A.1.4 Feedback

Positive: ”We got good feedback of the pitch 7 We were happy to hear that our vision to serve both the end-customer and as well as the whole ecosystem was an advisable approach”

”Something I did enjoy, was reading the reports”

”Overall, the pitch went fine as we were able to think of answers to questions on the spot” ”We received a 4 from it, which satisfied our group members”

”The feeling after the pitch was very good! We got good feedback so the effort was rewarded”

”That [success] definitely gave us extra energy and motivation to continue working hard”

Negative: ”I understand that the audience wanted to prepare us to the working life and act as real investors, but still, a one-liner feedback in the games webpage is not very constructive”

”In this [pitch] feedback we just got humiliated”

”However, some more thought could go into how much the course staff guides the students in the BMC pitch”

”But I still felt like it would have needed more clear guidance, and especially feedback and explanations for the results”

”There was several cases where it was a bit unclear how the game works which caused confusion and misunderstandings”

”The one negative aspect that I experienced throughout the game was the fact that we weren’t always sure what was expected of us, as I wrote in the issues and problems section”

”We hoped that somebody would even tell us that it was a learning experience, the business world can be cruel, but no, that moment never came”

”Due to the lack of constructive feedback there was nothing to be gained from the event except ”more should have been done by this time”

”The impact of that feedback was that we lost our motivation totally”

”The whole group went to that state of mind that some most likely even thought that they would quit the whole course”

A.1.5 Game implementation / logic

Positive: "The best part of the game was probably that by active participation I learned about the game dynamics and relations"

"When the bugs are fixed the experience will be more luscious and students will be more motivated to play the game"

"I think that the network aspect will set this course apart from the similar company simulation courses that wait me in the masters level"

"It was very nice that we were given freedom, how to negotiate and which instruments to use"

"The NSBG-game portal provided us with an abundance of information to be used for our financial analyses"

""I was quick to make some graphics for the logo and I think that the gesture of putting the logo and name to the company in the first 10 minutes of the game paid off" (features)"

"Something I did enjoy, was reading the reports"

"Interesting concept of the game with the introduction of the ecosystem network"

"I also liked the industry news, it gave a nice twist to the game"

"I must say though that having 4 fiscal years was a really good way to learn about making decisions, then seeing what works, what not, analyzing, forecasting and planning for the next year"

"I think it was very good that we had the account manager roles"

"I also made a pretty cool looking 8bit logo for our company (Spacium)" (features)

"I think the negotiations were extremely interesting and the best part of the game naturally"

"One of the interesting part in the game is also the role function assigned to each of the members"

"The fact that you had to think of the benefit of all the companies in the ecosystem was also exciting, and really different from what Ive used to in the business school"

"It was really interesting to face these issues of dealing with partners and working in network"

"I really preferred this part, negotiating with existing partner to find the best

options for everyone”

”Though I think it is very fair that the grade is not reliant on the game success”

”It was nice that we had the ability to freely choose our own markets and strategies based on reported information”

”It was also very interesting to go and see how other companies and ecosystems were performing and to compare our own companys results to them”

”Post-round analysis and planning decisions were the most interesting thing of the game: to see what kind of choices worked out well, which failed and what has been left out of sight at total”

Negative: ”The revenue and cost structure of the entire network is complicated, and every decision affects the plan”

”Instead it [forced participation] only limits player activity as it can cause significant downtimes for the game if one cant attend the game immediately”

”It would had made the game more interesting and more interactive if there were more company specific options that could be played around in a more agile way”

”To go around the account manager issue, we simply put the same password for all accounts so that everyone could act as everyone” [if you want to talk about account manager and forced participation]

”The purpose [of account manager] was good but the feature doesnt really help remove freeloading as such”

”For example we tried filling it together but not everyone was log in to a computer so we had to log in and log off the game and then decided that each one does a part of the canvas according to what we agreed and then check it together”

”Although there were some general instructions, it was more like guessing rather than making decisions based on concrete information :”

”In the end only, one of us made the real contracts and the others just send those mandatory offers which were required by the rules of the game and which were so unreasonable that the other companies couldnt have ever accepted them”

”As for the business model canvas, clearer instructions would have been needed as well”

”Honestly, an account manager role when really playing the game does not worked as it should, but I think that when we decided to have ecosystem

with no company changes, others roles went down, and only one of us made the real negotiations with other groups”

”I find the fixed feature is not flexible and just cause other students in difficult”

”However, to keep motivate students and relate the game to the study concept, I think more features should be added”

”However, this particular game did not allow for much creativity”

”There was several cases were it was a bit unclear how the game works which caused confusion and misunderstandings”

”We had a hard time getting our heads around how the system works and what are the key issues to take into consideration”

”regarding the game I think overall it is not too motivating that there is the ”endless capital” in use”

”Even some small effect [of game games results to grade] would be excellent motivator to succeed in the game and also it would have a positive side effect on the paper trail”

”During FY2-FY3 we were depressed and unmotivated [because of lack of success in the game]”

”Registration to the game was too complex”

”The fact that winning/not winning the game is not affecting your grade is just not really motivating to play it”

”What disappointed and unmotivated me to prepare for the pitch, was the fact that I knew that it is not going to affect our starting capital”

”The downside of Aalto Network Service Business Game is that the players do not get to design the services they offer”

”It felt pointless to toss RFPs for companies we didnt feel as suitable partners”

”Two quality variables with no knowledge on what they do, is too little, This only frustrates students and motivation towards the game gets low”

”Also the decentralization where a part of the instructions are located in the lecture slides, a part on the designated Noppa page and a part in the game itself makes it a frustrating task to look thing up”

”One of the limiting factors was that everyone was online at different times and the function of limiting the ability to send out RFPs, so that every group member has to have the same amount, turned out to be really annoying”

"The confusion that arose when the game was restored from a backup and it was a bit unclear what numbers had actually been used in the calculation of the results, was unfortunate for the trustworthiness of the game"

"Our whole team seemed really excited in the beginning but that also changed after a while because of all the uncertainty and confusions of the game"

A.1.6 Group work

Positive: "I'm especially happy about the popularity what the ecosystem spreadsheet I created gained within the ecosystem"

"It was great and fun to work with our ecosystem companies and their CEOs Roman, Aleksandr and Tony! I'm glad they were active and flexible so we were always able to set up a face-to-face meeting and get the decisions done"

"I was fortunate enough to have a group that shared the workload fairly and had good work ethics"

"As a team we immediately worked well together and were on the same page from the beginning"

"I think my team was good and we worked well together"

"I am very pleased of the performance of our group and I need to say that I was fortunate of having such good members in our group"

"Group work with students with different educational background is one of the highlights of the game and provides very valuable learning opportunities"

"Having people from three different Aalto schools, excited me, and I was expecting to learn a lot from the other students"

"I think that everybody in our company was happy about the teamwork"

"It was interesting to work with people from different backgrounds and history"

"I think already this short time together helped us to improve our team spirit and at least it made me feel much more positive about my group and most likely it made me work more intensively and eagerly to the benefit of our group" "It was also an interesting experience to work with such a big group"

"I did not know basically anyone in the course so in my opinion it was a perfect way to form groups randomly by the administrators"

"I had great guys in our ecosystem they can argue and support their posi-

tion with arguments, but if they find your arguments correct they'll take your opinion into account also"

Negative: "Team work always has its challenges regardless of how this course is organized"

"Practically my team mates didn't participate in any ecosystem meetings, significant effort had to be put to force them to write their part of the paper trail, and they had to be asked in order to get opinions and suggestions out from them"

"Concretely, students would have to ask couple online survey questions on their goals and readiness to put effort on this course after which they could be grouped better"

"One person in our group was extremely passive and didn't participate actively at all"

"He wrote less than two pages out of twenty for our paper trail and didn't do anything for the pitch"

"Personally, I'm not a fan of pre-assigned groups"

"In my opinion, this is the correct way to do it because it gives the groups diversity and in real business life you cannot always choose the people you are working with"

"Unfortunately I also felt that all the tasks were done alone by me: like create accounts, write company description, ask, inform and so on"

"The first thing that came to mind is "why can't we pick our own teams?" We are a large group of friends on the course who are used to working together" (forced teams)

"This [team member laziness] was very disappointing for me and I also had to spend extra time and energy in order to try to keep them involved"

"It is just extremely frustrating [that] this freeloader is going to get the same grade from the pitch AND the paper trail"

"I know this sounds harsh but I've studied in Aalto for six years now and I don't remember a single positive group work situation"

"However I do feel a little anxious about the group; with such collaborative and time sensitive tasks it could get pretty difficult if someone in the group is non-communicative, hard to reach or straight out won't take care of their responsibilities"

"Working with BMC Beginning of the work was pretty frustrating, some of the members were so inactive, late and we did not have any meeting minutes

to make common decisions about company business strategy”

Neutral: ”The idea was to get to know each other a little bit to break the ice and with higher team spirit we would be better motivated, as well as we would learn each others habits and ways of working”

A.1.7 Simulation

Positive: ”I think that kind of experience will prove to be valuable for me in the future”

”Also, it showed how valuable and important face-to-face meetings are”

”It was a good way to learn about many different things, such as communication, bidding, negotiation strategy and so on”

”Of course these things were on very basic level, but still I think that this game was a good platform to utilize the things that we have learned during our courses so far”

”The game itself was related to the course context and I see the added value in it”

”The challenges and problems of services in a network came pretty well up and in that sense the game was a learning experience”

”All in all, I found the game very interesting because we were able to tie our learnings from the classes with practical matters”

”Anyhow I really liked the idea of pitching your company and service and I think that is good and refreshing method for teaching and evaluating”

”This gamified way was indeed a nice learning approach to understand how service providers cooperate and build together the service and customer value”

”The strong element of Aalto Network Service Business Game was that it taught the players real project management and working scheduled”

”It [the pitch] was really professional and useful”

”I think business pitching overall is good practice for students and I actually quite enjoyed it even though I was slightly nervous beforehand”

”Firstly have to say that it was a great game for us to practice our skills and get an understanding of the nature of service business, glad to have the chance to participate”

” Extra points for choosing the interesting industry of space tourism!”

Negative: "The whole game was otherwise well managed and built but I would have preferred another market than space travelling, something that you actually could reflect to"

"It would maybe have been more educational to have something more realistic"

"However, it was still often very difficult to try to reflect some decisions to real life because we didnt know how the game actually worked"

"However, I feel that the game should better incorporate the course topics now, there is relatively little meaningful content to derive from the game and many interesting topics of the game are overlooked in the game"

"The pitches should be a way to learn, not a platform to humiliate the students"

"I understand it is a game but sometimes I got really frustrated with this part of the game [unrealisticness]"

"I dont really feel the strong connection about the game and the course material, to be honest"

"First, I wasnt too keen on the subject space tourism because I didnt really know much about it nor had ever been interested in space travel"

A.1.8 UI

Negative: "As a potential user interface designer I was not quite pleased on the conceptual level of the game interface"

"The game lacked a good visualization tool and so I had to gather the data manually"

"The user interface and experience of the game could be improved"

"The platform related to the offers and contracts was a bit complicated and not too intuitive to use"

"It is quite a pain on the first year to browse the company names and to find out which company is which"

"I mean not generally, but sometimes I was frighten to click the button, because I didnt know if I would be able to cancel changes"